

A Bulk Comptonization Model for the Prompt GRM Emission

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ABSTRACT

The “Supercritical Pile” is a very economical GRB model that provides for the efficient conversion of the energy stored in the protons of a Relativistic Blast Wave (RBW) into radiation and at the same time produces - in the prompt GRB phase, even in the absence of any particle acceleration - a spectral peak at energy ~ 1 MeV. We extend this model to include the evolution of the RBW Lorentz factor Γ and thus follow its spectral and temporal features into the early GRB afterglow stage. One of the novel features of the present treatment is the inclusion of the feedback of the GRB produced radiation on the evolution of Γ with radius. This feedback and the presence of kinematic and dynamic thresholds in the model are sources of potentially very rich time evolution which we have begun to explore. In particular, one can this way obtain afterglow light curves with steep decays followed by the more conventional flatter afterglow slopes, while at the same time preserving the desirable features of the model, i.e. the well defined relativistic electron source and radiative processes that produce the proper peak in the νF_ν spectra. In this note we present the results of a specific set of parameters of this model with emphasis on the multiwavelength prompt emission and transition to the early afterglow.